
Enhancing Defense Standardization

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*Specifications and Standards:
Cornerstones of Quality*

*Report to the Secretary of Defense
by the Under Secretary of Defense (Acquisition)*

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ACQUISITION

THE UNDER SECRETARY OF DEFENSE
WASHINGTON, DC 20301

TO THE SECRETARY OF DEFENSE

Enclosed are the results of our examination of the problems affecting the specifications and standards we use in defense acquisition. Our objective was to identify the actions necessary to prepare the Department better to deal with specifications and standards that are too old, technologically obsolete, unduly restrictive, contain unnecessary requirements, or do not comply with the policies of the Defense Standardization Program. Specifications and standards are the cornerstones of quality, and we must ensure they are current, concise, and correct if we are to achieve the quality we need in our weapon systems. The recommendations we are already putting into action center around six major thrusts: establishing accountability within the Military Departments and Agencies for achieving program objectives; conducting a comprehensive review of all specifications and standards to ensure they are in compliance with current Department of Defense policies; establishing closer relationships with non-Government standards bodies and industry; automating standardization data bases that serve as tools in the development, storage, retrieval, dissemination, application, and analysis of specifications and standards; establishing a budget line item for special standardization projects; and promoting expanded training for the developers and users of specifications and standards to effect the necessary cultural change.

The two points that came through clearly during this project were the need for more effective management and more cooperation. To achieve the cultural change necessary to improve significantly our specifications and standards requires greater management attention. We can no longer accept a *business as usual* approach, and have established standardization executives in each of the Military Departments and the Defense Logistics Agency who will be accountable for enforcing and implementing existing policies and the recommendations of this report.

Many of the key recommendations in the report cannot be achieved without the active support of the private sector. To help us identify and correct problems with our specifications and standards, we will be taking greater advantage of input from industry associations. Non-Government standards bodies will play a crucial role in replacing our military specifications and standards for commercial products and processes with world class non-Government standards. We have already met with several private sector organizations while preparing this report, and I have met with the presidents of the major non-Government standards bodies to solicit their support for our efforts.

The course we have charted for improvement is an ambitious one. But specifications and standards are the crucial basis of all our weapon systems. We are serious about improving quality and implementing total quality management, reducing costs, and bolstering defense industrial competitiveness, and we are already implementing the recommendations of this report.

A handwritten signature, likely of the Under Secretary of Defense, is located at the bottom right of the page. The signature is written in dark ink and is somewhat stylized.

FOREWORD

By Dr. Robert B. Costello
Under Secretary of Defense (Acquisition)

RE: Distribution Statement
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 Per SSgt. Dave Hochbrueckner, USD (Acq.)

To produce the best, highest quality weapon systems at the lowest possible cost is the major goal of the acquisition system within the Department of Defense. The specifications and standards used in the acquisition process have a major impact on our weapon systems. Specifications and standards that are current, state requirements in terms of what is needed rather than how-to-do something, and have the flexibility to accommodate innovative technological solutions, allow industry to focus on the basic product requirements and promote cost effective, outstanding quality, highly reliable, and easily maintained systems. Documents that are overaged, technologically obsolete, unduly restrictive, or contain incompatible or unnecessary requirements add to our acquisition costs, stifle innovation, and degrade the quality and reliability of our systems and products.

Recognizing the importance of well-written specifications and standards, we must improve the way we develop and administer the almost 50,000 documents managed under the Defense Standardization Program and listed in the *Department of Defense Index of Specifications and Standards*. The basis of our recommendations is a synthesis of selected findings and recommendations from the *Defense Science Board Report of the Task Force on Specifications and Standards* (the Shea Report), *An Assessment of the U.S. Defense Standardization and Specification Program* (the Toth Report), the *Final Report by the President's Blue Ribbon Commission on Defense Management* (the Packard Commission Report), and the *Defense Science Board 1986 Summer Study on the Use of Commercial Components in Military Equipment*.

The recommendations represent a cultural change taking place throughout the Department of Defense that emphasize quality. We cannot improve the quality of the products we buy until our specifications and standards properly define the requirements to satisfy the customers' needs. For too many years, there has been insufficient attention given to improving specifications and standards, but this is changing. We have embarked on a program that will challenge our managers to take charge, that will emphasize cooperation between Government and industry, and that will focus on preventing problems rather than reacting to them after they have occurred. What follows is a blueprint for improvement and a barometer to measure our success.

"The specifications and standards used in the acquisition process have a major impact on our weapon systems."

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"The recommendations represent a cultural change taking place throughout the Department of Defense that emphasize quality."



"...we are moving quickly."

This report is the result of the Department's Defense Standardization Study Team effort, involving members from my staff, the Military Departments, and the Defense Logistics Agency; and representing a cross-section of expertise in specification development, standardization management, data management, and logistics. The findings have been briefed to the Defense Standardization Council, the Departmental Standardization Offices, the Defense Science Board, and numerous industry associations and non-Government standards bodies. There has been enthusiasm for both the findings and the recommendations, and to maintain this initial level of support, we are moving quickly.

SUMMARY

Specifications and standards form the skeleton around which the defense acquisition process is built, and are necessary to satisfy the primary objective of any procurement action, which is to obtain required products in the proper quantity, of suitable quality, in the time needed, and at the lowest possible price. The importance of these documents, and standardization in particular, cannot be overemphasized. In his book *Out of the Crisis*, Dr. W. Edwards Deming argues that standardization was our number one weapon in World War II, and is responsible for providing the American consumer with lower prices, better quality, greater safety, and more productivity.¹ Within the Department of Defense, our emphasis on bolstering defense industrial competitiveness, total quality management, and making greater use of commercial off-the-shelf products places an even greater importance on the adequacy and appropriateness of our specifications and standards.

Both the *Defense Science Board Report of the Task Force on Specifications and Standards* (the *Shea Report*)² and *An Assessment of the U.S. Defense Standardization and Specification Program* (the *Toth Report*)³ concluded that while the existing body of specifications and standards essentially meets defense acquisition needs, there was considerable room for improvement. This remains true today. There are still numerous out-of-date and technologically obsolete documents that significantly contribute to the quality and production problems that ultimately inhibit our industrial competitiveness. Additionally, eliminating high-usage, cost-driver specifications and standards containing obsolete, marginal, and unrealistic requirements could yield substantial savings. While the Department of Defense has been actively promoting the use of non-Government standards and has adopted over 4,200 such documents, the *Final Report by the President's Blue Ribbon Commission on Defense Management* (the *Packard Commission Report*) noted that substantial savings could be achieved by even greater reliance on non-Government standards rather than overly-restrictive military speci-

"...substantial savings could be achieved by even greater reliance on non-Government standards rather than overly-restrictive military specifications for commercial products and processes. Using non-Government standards helps support our industrial base..."

1 W. Edwards Deming, *Out of the Crisis*, Massachusetts Institute of Technology, 1986, pp. 297-308.

2 Defense Science Board, *Report of the Task Force on Specifications and Standards*, Office of the Director of Defense Research and Engineering, Washington, D.C., 1977.

3 R.B. Toth Associates, *An Assessment of the U.S. Defense Standardization and Specification Program*, Office of the Secretary of Defense, Directorate of Standardization and Acquisition Support, 1984.

"...while enhancing our mobilization capability; and can also enhance cooperative programs with our allies. . ."

"If existing defense standardization policies were being fully implemented, we would not experience most of the recurring problems now associated with our specifications and standards."

fications for commercial products and processes.⁴ Using non-Government standards helps support our industrial base by taking advantage of commercial items and processes already proven in the marketplace, while enhancing our mobilization capability; and can also enhance cooperative programs with our allies and provide for greater commonality of our materiel.

If existing defense standardization policies were being fully implemented, we would not experience most of the recurring problems now associated with our specifications and standards. For example, the Department of Defense requires all specifications and standards that are more than five years old to be reviewed for technical adequacy and to ensure compliance with current policies. Reviewed documents are either validated as still current for use in acquisition, updated, canceled, or inactivated for new design. As of September 1988, over 7,200 overage documents listed in the *Department of Defense Index of Specifications and Standards* awaited review. Our policies also emphasize performance specifications over how-to specifications and non-Government standards over military and federal specifications and standards. Management, however, has been lackadaisical, enforcement was weak, and policies were often ignored. Accountability is key.

Our approach to specifications and standards was developed over 35 years ago, and while it can be effective for mature technologies and the reprourement of commodities intended for repair or replacement, traditional methods of preparing and maintaining specifications and standards in today's fast-moving, high-technology environment are ineffective. Today, a product can be developed, marketed, and become obsolete in the time it takes to develop a traditional military or private sector specification. For those specifications which will be used in development, what is necessary are highly-flexible *living documents* that allow the insertion of new technologies, new products, and new ideas.

Automation is an area in which we are not taking advantage of opportunities to improve the way we conduct business. With the notable exception of the Print On Demand System used by the Department of Defense Single Stock Point in Philadelphia to fill document requests automatically by using optical disks for storage and retrieval, little has been done throughout the Department of Defense to automate the development and dissemination of specifications and standards. Automation of document coordination, com-

⁴ *Final Report by the President's Blue Ribbon Commission on Defense Management*, 1986, pp. 85-86.

ment resolution, and analytical data would benefit all users with quicker document development, wider and more accessible distribution, and better management information.

In order to be more responsive to current and future acquisition needs, restore credibility to our existing specifications and standards, and generally revitalize the Defense Standardization Program, there are six broad areas in which action is required: (1) establishing accountability within the Military Departments and Agencies for achieving program objectives; (2) conducting a comprehensive review of all specifications and standards to ensure they are in compliance with current Department of Defense policies; (3) establishing closer relationships with non-Government standards bodies and industry; (4) automating standardization data bases that serve as tools in the development, storage, retrieval, dissemination, application, and analysis of specifications and standards; (5) designating an executive agent to program and budget for special standardization projects; and (6) promoting expanded training for the developers and users of specifications and standards to effect the necessary cultural change. Taking action in these areas will correct persistent problems, ensure these problems do not recur, and will allow us to seize new opportunities to perform our mission more effectively.

We are already acting upon several of the recommendations enumerated below, and our progress to date is noted:

- *Military Department and Agency Accountability:* Designate an office and a standardization executive within each Military Department and Agency with sufficient authority to mandate compliance with standardization policies. Standardization executives have been designated and met for the first time in May 1988, as members of the newly established Defense Standardization Council.
- *Reviewing Specifications and Standards:* Review all specifications and standards to ensure necessity, technological adequacy and currency, appropriate document series and identifier, and that they do not contain unnecessary requirements. Special emphasis will be placed on replacing military specifications and standards that describe commercial products and processes with either non-Government standards or commercial item descriptions. Military specifications may no longer be issued or revised for nearly 400 federal supply classes where there is a high potential for commercial acquisition.

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- ***Living Specifications:*** Establish a pilot program to convert traditional military specifications to living specifications that will allow for insertion of new technologies without requiring major revisions. The Defense Electronics Supply Center, in a pilot program, is now revising some microcircuit, capacitor, and resistor specifications as living specifications.
- ***Non-Government Standards:*** Increase the number of non-Government standards adopted by the Department of Defense by simplifying the adoption process and restricting the issuance of military specifications and standards for commercial products and processes. There should be a commitment on the part of the non-Government standards bodies to develop more product standards to replace the existing military specifications and standards. The standardization executives are currently reviewing a new system to greatly simplify the adoption process. Under the new system, non-Government standards bodies would coordinate drafts of proposed standards with the Department of Defense, and adoption would be concurrent with approval of the standard. Also, once a standard was adopted by the Department, all future revisions and changes to that standard would automatically be adopted. These actions will eliminate the lengthy coordination process that now occurs each time a new or revised non-Government standard is issued, and will help ensure that the Department is using the most current standard.
- ***Automation:*** Automate data bases that serve as tools in the development, storage, retrieval, dissemination, application, and analysis of specifications, standards, and other standardization documents. Significant progress has been made in the area of storage, retrieval, and dissemination of documents with the Print On Demand System, but much more needs to be done. The Standardization Automation Users Panel recently held its first meeting and is developing an automation plan.
- ***Training:*** Enhance education and training. The Defense Systems Management College is developing training modules to educate defense personnel on the proper use, management, and development of specifications and standards. The Army Logistics Management College is revising their course on specifications to emphasize alternatives to military specifications.

- *Funding: Designate a single Military Department or Agency to program and budget funds as executive agent for Defense Standardization Program special projects.*
- *Forging the Right Relations With Industry: Establish regular meetings with major industry associations and non-Government standards bodies to solicit recommendations on improving the specifications and standards used by the Department of Defense. Create a directory that will allow industry and non-Government standards bodies to identify readily the proper Department of Defense standardization management activity when problems, opportunities, and questions arise involving various commodities or documents. The Under Secretary of Defense (Acquisition) has met with the presidents from several non-Government standards bodies to ask that their organizations develop more world class product standards to replace military specifications for commercial products. Input is being collected for the generation of a standardization directory to benefit Government, industry, and non-Government standards bodies.*
- *Feedback on Specifications and Standards: Encourage and facilitate user feedback on specifications and standards. The Standardization Document Improvement Proposal Form and associated procedures are being revised to promote comments and to identify a control point to ensure a timely and appropriate response to the comments. The revised form will be attached to the back of all specifications and standards issued from the Department of Defense Single Stock Point.*
- *Reporting Standardization Accomplishments: Utilize the Annual Department of Defense Standardization Accomplishment Report to measure Military Department and Agency progress towards specified standardization goals. The Defense Standardization Manual is being revised to require more specific reporting procedures.*
- *Department of Defense Index of Specifications and Standards: Improve the accuracy of the data in the Department of Defense Index of Specifications and Standards, and also restructure it to indicate more clearly the purpose of each document cited, such as whether it supports item development, reprocurement, unique military applications, or commercial acquisition. Associated with the automation effort, the Standardization Automation Users Panel is looking at ways to restructure the Index. Also, the Military Departments*

"...develop more world class product standards to replace military specifications for commercial products."

and Agencies have been tasked to conduct an immediate review of the *Index* to ensure its accuracy and take corrective action where necessary.

- *Lead Standardization Activity Responsibilities: Evaluate whether the current lead standardization activity assignments are appropriate, and ensure these activities are fulfilling their responsibilities.* This evaluation is underway, and with assistance from the Departmental Standardization Offices, will be completed within six months.

I. OVERVIEW

In some quarters, there is an opinion that military specifications and standards are excessively restrictive, obsolete, and not cost effective. While there are examples to support each of these beliefs, most military specifications and standards are well-written documents that form a national treasury of technical information that is used extensively not only by the Federal Government, but by state and local governments, our allies, and industry. The Department of Defense, in fact, initiates and maintains the largest body of specifications and standards in the free world. These documents fill a technical void that is the result of a lack of national product standards from non-Government standards bodies. In many industries, manufacturers of commercial products rely heavily on specifications and standards generated by the Department of Defense. A 1982 report by the Aerospace Industries Association entitled *Impact of International Standardization Trends on the U.S. Aerospace Industry* demonstrated that military documents accounted for 20 percent of the specifications and standards used in a typical, commercial wide body airliner, and 17 percent of the specifications and standards used in a typical, commercial jet engine. The report further stated that about 5,000 military specifications and standards are used on a regular basis in the aerospace industry.⁵ Clearly, there would not be such voluntary dependence on military specifications and standards if these documents were not technically valuable and cost effective.

"The Department of Defense, . . . initiates and maintains the largest body of specifications and standards in the free world. These documents fill a technical void that is the result of a lack of national product standards from non-Government standards bodies."

There are, however, systemic problems with our specifications and standards that result from ineffective management and our inability to react to a changing world. When the Cataloging and Standardization Act of 1952 first established the Defense Standardization Program, there were enough people in our standardization and engineering offices to generate and maintain whatever specifications and standards were required by the Department of Defense. Repeated budget cuts, ceilings on salaries and personnel levels, and other factors have taken their toll on the Defense Standardization Program, and we now have fewer people responsible for maintaining a greater number of documents than just 20 years ago. For example, the *Toth Report* noted that in 1968 the Army funded its portion of the Defense Standardization Program at a level of 1,021 man years. In 1983, it was funded at a level of only 325 man years.⁶ Consequently, the Depart-

⁵ Aerospace Industries Association of America, *Impact of International Standardization Trends on the U.S. Aerospace Industry*, The Aerospace Research Center, 1982, pp. 19-21.

⁶ Toth Associates, *op.cit.*, p. 5-9.

"The Department of Defense no longer has the resources to be a *de facto* national standards organization."

"Tremendous resources are wasted on maintaining specifications and standards that are only marginally different. . ."

ment of Defense must make better use of its resources by streamlining the body of specifications and standards that it prepares and maintains; confining them to those that describe uniquely military items that contribute to our fighting capabilities. The Department of Defense no longer has the resources to be a *de facto* national standards organization. More effort and resources must be expended by the Department and the private sector to answer our national needs with the development of more and better non-Government standards.

The Military Departments and Agencies must also put an end to issuing documents that only serve their parochial interests. Tremendous resources are wasted on maintaining specifications and standards that are only marginally different, or that reflect artificial differences resulting from too many how-to requirements rather than performance requirements. This not only diminishes our resources, but also increases the cost of the items we buy since industry must make changes in their production, quality, and management processes to accommodate these differences. The Department of Defense is currently consolidating 40 specifications and standards for technical manuals into one specification and one standard. This represents the first phase in an effort that will ultimately consolidate nearly 200 documents into just two, and provide the Department and industry with one set of instructions on the preparation of technical manuals. More of these cooperative undertakings need to be initiated in other areas, not only to conserve resources, but to enhance our standardization efforts.

An important part of improving our specifications and standards will be assertive management within the Military Departments and Agencies with the authority to ensure that policies are implemented. The necessary authority now exists with the standardization executives and the Defense Standardization Council. Existing policies and goals need to be converted into specific, measurable objectives that the standardization executives can be held accountable for achieving.

The following chapters: provide a more detailed examination of the current management structure of the Defense Standardization Program; explore the specifications and standards themselves; and provide recommendations for action.

II. MANAGEMENT ISSUES

The Defense Standardization Program is a decentralized program with overall policy and administration centered in the Office of the Assistant Secretary of Defense for Production and Logistics. Within each Military Department and the Defense Logistics Agency, there is a standardization focal point called the Departmental Standardization Office with the responsibility for translating these policies into specific objectives for their respective Military Department or Agency, and ensuring compliance. The Departmental Standardization Offices provide the centralized authority necessary to manage the 117 standardization management activities that prepare or contribute to the preparation of specifications and standards. Another important management function is handled by the lead standardization activities, which have responsibility for ensuring the specifications and standards within an assigned federal supply class or standardization area comply with policies and maximize standardization of products and processes.

A. AUTHORITY AND ACCOUNTABILITY

Department of Defense policies on specifications and standards are often ignored or not fully implemented because each Military Department and Agency seems to lack an office with sufficient authority to enforce implementation of policy. A management structure exists that is supposed to provide centralized control and direction over the program. In reality, however, specification preparing activities are far more responsive to the goals set by their local commanders, and these do not necessarily support the corporate policy objectives of standardization. Unless senior managers set specific objectives for the program and are held accountable for achieving those objectives, it will be difficult to make significant improvements to our specifications and standards.

"...policies on specifications and standards are often ignored or not fully implemented. . ."

Defense Materiel Standardization and Specification Board

The idea behind the Defense Materiel Standardization and Specification Board was to bring together senior standardization managers from the Military Departments and Agencies to recommend policies, focus on standardization problems and opportunities, develop a plan to accomplish goals, and prioritize objectives for the appropriate allocation of resources. It was a good idea that failed. The last Board meeting was held in 1983, but long before then, it had begun to degenerate into a gathering of middle level managers who

... "until senior management actively applies judgment to the details of the program, not only to general direction, little improvement can be expected."

did not have the authority to act for their respective Military Departments and Agencies or commit the necessary resources. In addressing the effectiveness of the Board, the Shea Report noted that *"until senior management actively applies judgment to the details of the program, not only to general direction, little improvement can be expected."*⁷

Judging from the last program guidance issued by the Board in 1983, they did not heed the recommendation of the *Shea Report*. The guidance consisted of seven general objectives that did not commit resources, establish benchmarks to measure performance, designate specific assignments, or establish priorities, and again, there was no accountability. The Board seemed to use a hands-off management approach that left responsibility for the program to the middle level managers in the Departmental Standardization Offices. The Board never met again, and for the last five years, the Defense Standardization Program has not had the coordinated senior management level attention that, if properly applied, could make a positive difference.

Departmental Standardization Offices

Day-to-day management responsibilities for the Defense Standardization Program are delegated to a single office within each Military Department and Agency known as a Departmental Standardization Office. The Departmental Standardization Offices are responsible for developing and implementing internal standardization guidance, ensuring that adequate budgets and staff are provided to support the program, and ensuring the implementation of policy. Each Departmental Standardization Office is also assigned a body of federal supply classes and standardization areas for which they serve as the Department of Defense focal point to plan and manage all standardization actions in that class or area. This authority is usually delegated to another office known as the lead standardization activity, which has the technical expertise to manage certain commodities or disciplines.

"Generally, the Departmental Standardization Offices have been ineffective."

Generally, the Departmental Standardization Offices have been ineffective. They are grossly understaffed, lack sufficient authority to mandate policy compliance, and they have not had the necessary support of the now defunct Defense Materiel Standardization and Specification Board. In some cases, the Departmental Standardization Office is little more than a bureaucratic conduit that

7 Defense Science Board, op.cit., p. III-2.

funnels policy from the Office of the Secretary of Defense to standardization management activities.

Lead Standardization Activities

Lead standardization activities are the management organizations delegated the responsibility for analyzing, planning for, and ensuring maximum standardization within a federal supply class or standardization area. They prepare standardization program plans to identify problems and opportunities; track the tasking in program plans to ensure implementation; authorize the development or revision of specifications and standards; and ensure there are no overlapping, duplicative, or overage specifications or standards within a federal supply class or standardization area. There are some lead standardization activities that do a fine job, but by and large, most do not manage all the areas of their responsibility effectively. Some lead standardization activities fail to prepare program plans, or prepare plans that may fulfill the requirement, but do not serve their intended function as a blueprint for the future. Obtaining authorization from the lead standardization activity to develop or revise a specification or standard is usually routine, and there is often no research conducted concerning the need, possible duplication, whether documents could be combined, or whether a non-Government standard could be used instead of a military document.

The reasons for the inadequacies of the lead standardization activities vary. Some offices are not staffed either with sufficient numbers of people or the right types of technical people to perform this function. Most of the lead standardization activity assignments were made over 30 years ago, and in some cases, they no longer have the dominant technical capability or interest to do a good job. For example, the General Services Administration has the Government's expertise for hand tools and prepares the vast majority of hand tool specifications and standards used by the Department of Defense, yet they are not designated as the lead standardization activity for the hand tool federal supply class. Finally, there is no training available to instruct on how to perform the responsibilities of a lead standardization activity.

B. FUNDING

Funding has been a serious management problem for standardization for a long time. There is often insufficient money to update overage documents, to follow through on the tasks in program plans, to attend technical committee meetings to develop non-Government standards, and to accomplish a myriad of other special standardization

projects that might come up during the year. Much of the basic funding problem can be tied back to inattentive managers. Standardization and the writing of specifications and standards is not a glamorous field, and the only way the Defense Standardization Program can successfully compete for greater funding is by having managers demonstrate that the program more than pays its way with tangible savings, reduced costs, improved mission readiness, and more reliable logistics support.

C. MANAGEMENT INFORMATION

One of the major problems facing all levels of management in the Defense Standardization Program is the lack of meaningful and timely information that can be used for planning purposes and for selling the benefits of standardization at budget time. At present, there is a wealth of information that is either not readily accessible or cannot easily be manipulated into a useful form. For example, the *Status of Standardization Projects* lists ongoing projects within the Department of Defense to develop or update specifications and standards. This list is published quarterly and contains a variety of management information, but by the time it reaches the hands of managers and other users, the data in it may be several months old. The data base that generates the *Department of Defense Index of Specifications and Standards* is another potentially valuable management tool, but it too suffers from a lack of on-line access and the inability to manipulate the data for specific purposes. For example, a decision has been made to design the Army's new light helicopter in metric units. The program manager needs to know how many metric specifications and standards already exist that might be used. The only way this information can be extracted is to research manually each of the nearly 50,000 documents listed in the *Department of Defense Index of Specifications and Standards*. In another area, lead standardization activities would benefit from being able to compile lists of coverage documents automatically. For those federal supply classes consisting of hundreds of documents, the process of manually checking the date of each document is a laborious task that could be automated easily.

III. IMPROVING SPECIFICATIONS AND STANDARDS

At one time or another, poor quality, unsatisfactory performance, *goldplating*, schedule delays, and excessive costs have all been attributed to military specifications and standards. They have been widely criticized by military users, program managers, industry, and the Congress, who all have a favorite story to illustrate their contentions. Some critics have even suggested that perhaps the world would be a better place without these documents. In the last 25 years, there have been at least eight studies that have reviewed the quality of our military specifications and standards. Each of these studies basically confirmed that specifications and standards are essential to defense acquisition, and that generally, they meet the needs of the Department of Defense. These studies, however, go on to note that substantial improvements can be made, and until they are, the whole system of specifications and standards will suffer from a credibility problem.

A. THE RIGHT DOCUMENTS WITH THE RIGHT REQUIREMENTS

There are approximately 7,200 overage documents listed in the *Department of Defense Index of Specifications and Standards*. Several *cost driver* military specifications and standards have been identified that are frequently referenced in defense contracts, which contain requirements that are either obsolete, contradictory, unrealistic, unessential, or instruct the contractor on how-to-manage. Periodically, military specifications on chewing gum, cookies, fruit cakes, and other such items are ridiculed for seemingly ludicrous requirements. We tend to take comfort in the fact that there are thousands of documents that are not in disrepute, but what steps are being taken to correct the ones that are? As long as it is relatively easy to identify shortcomings in our specifications and standards, such documents will be used as examples to disparage the whole system. We need to instill a high level of confidence that we are developing the right documents with the right requirements.

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Commercial Versus Military

Both the *Packard Commission Report* and the *Defense Science Board 1986 Summer Study on the Use of Commercial Components in*

"...the Department of Defense could substantially reduce costs, reduce lead times, improve product quality and reliability, and increase responsiveness to meet surge and mobilization requirements through the greater use of commercial products."

*Military Equipment*⁸ concluded that the Department of Defense could substantially reduce costs, reduce lead times, improve product quality and reliability, and increase responsiveness to meet surge and mobilization requirements through the greater use of commercial products. While acknowledging that commercial products are bought to military specifications, both reports asserted the current process can inhibit the use of commercial products.

By definition, military specifications are written to cover systems, subsystems, components, items, materials, or products that are intrinsically military in character; and yet, military specifications exist for toothpicks, money bags, dog muzzles, mustard, and many other items that could hardly be described as intrinsically military in character. It is an interesting dichotomy. These documents were written, of course, to fill an acquisition need. In the competitive environment in which the Department of Defense must operate, specifications are required to communicate requirements and ensure a requisite level of quality. Without a specification, the Department would have to either specify a brand name, which would be construed as restricting competition, or hope that when we issued a contract for mustard, we did not end up with a watered-down, yellowish, tasteless substance purported to be this familiar condiment.

Establishing military specifications for obviously commercial products creates numerous problems. First, it detracts from the number one reason why we have military specifications, which is to establish the technical requirements for military equipment needed on the battlefield. Additionally, the scarce resources being dedicated to developing and maintaining military specifications for commercial products could be used to improve documents that support military hardware and mission readiness. Of the nearly 50,000 documents listed in the *Department of Defense Index of Specifications and Standards*, 34,000 of them are military specifications and standards. It has been estimated that as many as 20,000 military specifications and standards describe commercial products or processes. Even if the actual figure is only half that amount, not paying the cost of supporting 10,000 military documents would be significant.

Another problem the Department has with military specifications for commercial products is they do not always reflect what is currently available in the commercial market or best commercial practices. Since mission readiness is our number one priority, those

⁸ Defense Science Board 1986 Summer Study, *Use of Commercial Components in Military Equipment*, Office of the Under Secretary of Defense for Acquisition, Washington, D.C., January 1987.

specifications and standards that support this priority are the ones that receive the most attention, and the documents that specify the requirements for more commonplace, but still important items are sometimes neglected. Because commercial manufacturers are continually trying to capture new markets with new products, military specifications for commercial products are prone to obsolescence, resulting in higher prices, availability problems, and the need for contract modifications.

Non-Government Standards

Non-Government standards offer one of the best alternatives to military specifications and standards for commercial products and processes. These standards are usually prepared by technical committees comprised of users, producers, consumers, academia, and others from both the private sector and federal, state, and local governments. The Department of Defense has had a policy to use non-Government standards instead of Government documents for a long time, and has adopted over 4,200 non-Government standards.

While progress has been made in replacing military specifications and standards, the pace has been slow. Some activities have been especially fearful of using non-Government standards instead of Government documents. This reluctance is based on *rice bowl* attitudes; the belief that non-Government standards are inferior and written to the lowest common denominator; the belief that the private sector consensus method is too time-consuming; and the fear of losing control over the requirements in a document. There are examples to support these attitudes, but in general, documents generated by the major non-Government standards bodies are good, and these organizations are prepared to work with the Department to ensure their standards are suitable for our purposes.

One legitimate reason for not using more non-Government standards in acquisition is that most of them address test methods, processes, recommended practices, and safety, but few of them are for products. Of the 35,000 non-Government standards, it is estimated that at most, there are only 8,000 product standards. The non-Government standards bodies have expressed a willingness to work with the Department of Defense and other users to develop more product standards, and it is the Department's policy to try to incorporate its requirements into existing non-Government standards or to encourage developing new ones instead of updating or issuing new Government documents. Some Department of Defense activities are implementing the policy of replacing Government documents with non-Government standards, whenever possible, but many are not.

"The non-Government standards bodies have expressed a willingness to work with the Department of Defense and other users to develop more product standards. . ."

Policies governing the cancellation of federal specifications and standards also limit the use of non-Government standards. Although the Department of Defense prepares most federal specifications and standards, only the General Services Administration is authorized to cancel these documents. When the Department decides to replace a federal document with a non-Government standard, the federal document is returned to the General Services Administration with the recommendation they cancel and supersede the document. Because of manpower constraints and their lack of a formal non-Government standard adoption process, the General Services Administration usually does not implement the recommended action. As a result, the federal document remains in the system, and it continues to be used.

Another problem facing greater development and use of non-Government standards comes from industry and the non-Government standards bodies themselves. While users prefer product standards, there is often opposition from manufacturers on committees who oppose the development of standards that might exclude their product, or that might level the playing field, making less important those product differences that are marketed as selling points. Such attitudes, for example, have been demonstrated in the frustrating attempts to produce the first commercial paint product standard. While there are over 100 non-Government standards for the sampling, analyzing, application, and testing of paint, producers have successfully delayed issuance of the first paint product standard from one major standards organization for over 10 years. Consequently, military and federal specifications are used to buy paint.

While Department of Defense participation is welcome, some non-Government standards committees are concerned about the level of commitment on the Department's part. Before a committee expends the resources to respond to a Department of Defense need, there must be consistent participation, which means having the same representative regularly attend meetings and be willing to do a fair share of the work. Attending non-Government standards committee meetings usually receives a low priority when allocating travel funds, and technical personnel are often not evaluated and given credit for the committee work they perform. Both of these conditions must change.

"A promising alternative to Government specifications is using multiple award schedules."

Multiple Award Schedules

A promising alternative to Government specifications is using multiple award schedules. Although the Department has some limited experience using multiple award schedules to procure certain petroleum products and subsistence items, multiple award schedules

generally have been viewed as a procurement tool used only by the General Services Administration. The Department of Defense is now looking at expanding its use of multiple award schedules as a means to increase and simplify the acquisition of commercial equipment. Some of the benefits to be realized through multiple award schedules include reduction of procurement lead time, increased use of commercial products, increased competition, and greater authority for acquisition managers. Another benefit is that in some instances, Government specifications can be eliminated and replaced by a short description of the commercial equipment. The multiple award schedule approach is not suitable for all types of commercial products, and the Federal Acquisition Regulation only allows their use when it is not practical to draft specifications. Multiple award schedules do lend themselves to acquiring complex commercial equipment, such as material handling, construction, food service, communication, automotive, and aircraft ground support equipment.

Living Specifications

The present approach to developing military specifications is not always responsive to the user's needs, and does not encourage vendors to supply the most current state-of-the-art items. Supplying products in accordance with traditional military specifications requires only meeting the specified requirements, and there is little incentive to do better or to produce better quality products.

In order to change the traditional approach to military specifications, we are pursuing the concept of a *living specification*, which is defined as a formatted document that allows for rapid insertion of new technology, permits the use of advanced manufacturing processes, and facilitates continuous quality improvement without the need for major revisions or updates to a specification. *Living specifications* might assume a variety of appearances, such as a performance specification or a fill-in-the-blank guide specification. The concept is not totally new to the Department of Defense. For example, the Air Force Aeronautical Systems Division has converted 55 of their military specifications to fill-in-the-blank guide specifications where industry expertise is sought to assist the Department in satisfying requirements for each procurement action with the most technologically advanced and appropriate solution.

We must avoid needlessly expanding the traditional quality control inspection program. We have a tendency to add more testing in order to correct various quality related problems. This approach has contributed to a decline in competitiveness. There is a need to seek out and correct the root cause of the problems, and to design and

"...a living specification, . . . is defined as a formatted document that allows for rapid insertion of new technology, permits the use of advanced manufacturing processes, and facilitates continuous quality improvement without the need for major revisions or updates to a specification."

manufacture quality into the product. The *living specification* supports implementation of the Department's total quality management program that includes such tools as statistical process control for reducing reliance on end-of-line product inspection.

To be more responsive to the *living specification* concept that allows for rapid insertion of new technology, there must be full implementation of the qualified manufacturers list program. A qualified manufacturers list allows the manufacturer to provide, and the purchaser to obtain, satisfactory evidence the supplier has the capability to manufacture a product meeting all the requirements of an associated specification. The qualified manufacturers list program provides for certifying and approving a manufacturer's entire manufacturing line in lieu of qualifying individual products. The manufacturer must demonstrate that manufacturing processes are under control, a feedback system is in place, and a verification capability to meet specification requirements exists. This program will allow the Department of Defense to work with manufacturers and recognize their process capabilities through accreditation and certification, and rely on their certified manufacturing processes, provided evidence demonstrates that the product conforms to the specified performance requirements.

While a few Department of Defense activities have issued documents that encompass the concepts behind the *living specification*, most continue to issue the traditional military specifications with which they feel comfortable. It is recognized the *living specification* approach is not applicable in all cases, particularly in reprocurment specifications where exact design interfaces may be critical, but we need to break free from past solutions that will no longer satisfy the user's needs in today's fast moving, high technology environment.

Training

"...there must be far more training than now exists."

A major obstacle to getting the right documents with the right requirements is breaking the bonds of traditional thinking. To induce document developers and users to consider alternatives to military specifications and standards, there must be far more training than now exists.

The Defense Specification Management Course taught by the Army Logistics Management College is the only such course currently available throughout the Department of Defense. The course is excellent for what it does, and that is to instruct on the development of military specifications. The course is primarily directed at specification writers, although many of the attendees are from a wide

variety of fields, including logistics, quality assurance, packaging, engineering, and library science. Most of these people do not need to know how to write specifications, but they must learn how to use them.

There is also a brief segment on standardization in the Program Manager Course taught by the Defense Systems Management College, and several private companies teach specification writing courses as well. Again, the emphasis in these courses is on writing and using military specifications.

There must be a whole rethinking of our training requirements. There are not nearly enough courses to accommodate the number of students. In the existing courses, we must shift the emphasis from writing and using military specifications to first considering alternatives, such as non-Government standards, commercial item descriptions, and multiple award schedules. Shorter training modules need to be developed for specific audiences to educate them on our standardization policies and documents, and how they fit into the specialized world of quality assurance or logistics or some other discipline.

Management of specifications and standards is another area where training is sorely lacking. There are complaints about the ineffective management of many of the lead standardization activities, and yet, there are no courses to educate their personnel on how to carry out such standardization management responsibilities. There needs to be a special course to instruct the personnel in lead standardization activities how to prepare and implement program plans, to evaluate alternatives before authorizing the development or update of a specification and standard, and to properly manage a federal supply class or standardization area to ensure compliance with the Department's policies.

Program Plans

An important tool to ensure the Department of Defense is developing the right types of documents is the program plan. In theory, the program plan provides management with a detailed look at standardization problems, opportunities, and objectives within a federal supply class or standardization area, and one of its purposes is to identify any problems with specifications or standards; and schedule resources and milestones to correct the problems. In practice, however, most program plans provide little more than statistical data and a few generalities, without ever defining a comprehensive plan or committing resources to improve the documents within a federal supply class or standardization area.

Misconceptions

Specifications and standards face a problem of perception. The structure of the *Department of Defense Index of Specifications and Standards* is such that it often leads to wrong impressions in the Congress, in the press, in industry, and even in the Department of Defense. Most people believe there are 50,000 military specifications and standards listed in the *Department of Defense Index of Specifications and Standards*. While there are nearly 50,000 documents listed, there are only about 27,000 military specifications and 7,000 military standards. The others are federal documents (many of which are issued by the General Services Administration), non-Government standards, handbooks, qualified products lists, international standardization agreements, bulletins, and a few other types of informational documents.

Because the index has *Department of Defense* in the title, it is logically, but not correctly, assumed they are all military documents prepared by and for the Department of Defense. As a result, the Department is sometimes unfairly criticized. This problem will grow worse in the future. The General Services Administration is responsible for issuing the *Federal Index of Specifications and Standards* which lists documents prepared by civilian agencies, but because of budget cuts over the years, they have not updated this index since 1983. The General Services Administration is negotiating with the Department of Defense to have all of their specifications and standards put onto the Print On Demand System, and indexed in the *Department of Defense Index of Specifications and Standards*. A few other civilian agencies have also expressed an interest in the Print On Demand System, and in the Department's specifications and standards program. This interest may result in a much broader and unified federal standardization and specification program, which would be beneficial to the Government, but could create additional perceptual problems if the format of the *Department of Defense Index of Specifications and Standards* is not changed.

B. AUTOMATION

The standardization community has been slow to take advantage of automation to improve document productivity and usefulness. The newly operational Print On Demand System at the Department of Defense Single Stock Point in Philadelphia is a major step forward in the storage, retrieval, and dissemination of specifications and standards; but much remains to be done. Essentially, the development and dissemination of specifications and standards is still a slow paper process from start to finish. Information that would be valuable to

managers, users, and document preparers is either not readily available or is not provided on a timely basis. Automation is key to providing better documents, more quickly, and making them more accessible.

The Paper Trail

Typically, the development of a specification or standard involves a great deal of time and paper. Once a draft document is entered into a word processor or personal computer, hundreds of paper copies are photocopied and distributed in the mail for coordination and comment. Usually, a few of the offices on the distribution list do not receive their copies for some reason, and more copies are sent out, causing further delays. Typed comments on paper are then mailed back, and once the comments are resolved, typed responses on paper are mailed to the commenters. The approved paper document is then mailed to the Department of Defense Single Stock Point where it is scanned onto an optical disk. After an initial distribution of thousands of paper copies to users of the document, future requests are printed from the optical disk, and a paper copy mailed to the requester. While it may be some time before we can eliminate paper copies, direct on-line access has the potential to save a great deal of time and expense by using electronic means to coordinate documents; make, receive, and resolve comments; and transmit documents directly to the printing and distribution point.

Key Word Searches and Full Text Access

Often times Government buyers, program managers, and prime contractors are unaware of existing specifications and standards that would meet their needs. The *Department of Defense Index of Specifications and Standards* provides a numerical, alphabetical, and federal supply class listing of these documents, but it is not always possible to identify a potentially satisfactory document by title alone. The Department of Defense Single Stock Point is now creating a data base that will have key word search capability, greatly assisting users in locating the right documents.

Future plans call for the electronic submission of specifications and standards for use in a data base that will permit full text access. There will also be a capability to perform word searches within each document that will prove a valuable tool that can save thousands of man hours each year. For example, a few years ago during litigations pertaining to the use of asbestos, every specification and standard used by the Department of Defense had to be reviewed manually to determine if there was a requirement for asbestos. This was a slow,

"Automation is key to providing better documents, more quickly, and making them more accessible."

time-consuming process, and undoubtedly, there were oversights. Full text access and search capability would have made this a much easier task, and increased the accuracy of the review. There have been similar reviews conducted on a much smaller scale for mercury, cadmium plating, and other potentially hazardous materials, and there will be other such reviews required in the future.

Project Registration

The Department of Defense registers all projects for specifications and standards in a paper publication identified as the *Status of Standardization Projects*. This publication allows the standardization community to know what new documents are being developed, what existing documents are being updated or adopted, provides milestones, identifies the preparer of the document, and indicates document approval. The *Status of Standardization Projects* can prevent duplication of effort, and alert users that a document is being changed in case they want to comment or alter their procurement strategy. The problem is that the *Status of Standardization Projects* is not timely. The data is collected once a quarter, and by the time the data is entered, the computer run printed, and thousands of copies distributed, several months have elapsed and much of the data is no longer correct or relevant.

There are plans to integrate this data base with the one serving the *Department of Defense Index of Specifications and Standards*, and make this unified data base available for on-line query and update. An attractive alternative to maintaining the *Status of Standardization Projects* is the project registration system being developed by the American National Standards Institute. The ultimate goal of this ambitious project is to provide information on all ongoing standards development activity in the United States, and thereby avoid duplicative efforts on a national basis. The American National Standards Institute has not been able to implement this national project registration system because of various technical, political, and financial problems, but once such a system is available, the Department of Defense will use it.

Department of Defense Index of Specifications and Standards

Many of the problems associated with project registration are identical for the *Department of Defense Index of Specifications and Standards*. The Index is updated every two months, but much can change during this period, and defense contracts and solicitations do not always reflect the latest information because of the absence of on-line access. Another problem is the *Department of Defense Index of*

Specifications and Standards contains thousands of errors that could be more readily corrected if the activity having responsibility for a document had access to the data base to make the necessary corrections.

Automated Specifications and Standards Information Retrieval

The *Shea Report* noted that the main problem with specifications and standards was not the documents themselves, but their improper application.⁹ Even well-written specifications and standards can produce problems if they are applied to specific program situations where all the requirements do not apply, or if no effort is made to control the tiering effect of referenced documents. The Navy has developed an automated specifications and standards information retrieval system to provide program managers, engineers, and acquisition managers with automated reports on specification trees, reference lists, key word indexes, overage documents, canceled documents, and other information that would be useful in making decisions on the proper application of specifications and standards. This data base is now being expanded for use throughout the Department of Defense and industry, and eventually will be managed by the Department of Defense Single Stock Point.

C. INDUSTRY RELATIONS

While relations between the standardization management activities and industry are generally good, communications can be improved. Standardization management activities often express a sense of frustration when they hear in general terms of deficiencies with specifications and standards, but seldom receive official comments either from industry or defense users. The *Shea Report* noted that although all specifications and standards are required to have a self-addressed Standardization Document Improvement Proposal Form to provide comments on a document, only about 1,200 comments a year were received on over 40,000 documents (1976 figures).¹⁰ Standardization management activities feel as though they are fighting ghosts when criticisms of documents seldom materialize in solid form. Industry has voiced several reasons for not using this form for providing feedback. Although it is attached to the back of every specification and standard, many users are unaware of this form. Also, many users access documents through a private sector microform service, and the form is not included. Some users in industry have indicated they do not have the time or inclination to

*"...communications
can be improved."*

⁹ Defense Science Board, op.cit., pl-1

¹⁰ Defense Science Board, op.cit., pl-12

complete the form, and they would prefer having a telephone number to call and discuss comments. Finally, some industry users who have used this form complain that they never receive an answer or that the response is some vague statement that the comment will be considered the next time the document is updated. Feedback on documents would probably increase if industry were assured a prompt, meaningful reply.

The Standardization Document Improvement Proposal Form is a passive attempt to generate feedback on specifications and standards. By using the resources of multi-industry associations, the Department of Defense could take a more active approach to obtain feedback. To be successful in improving the existing specifications and standards, those documents that are duplicative, technically obsolete, too restrictive, or good candidates for replacement by a non-Government standard must first be identified. Industry associations could be used to conduct surveys, create small working groups to address specific issues, and to get a better pulse on whether purported problems affect an entire industry or just a company within the industry. Such active solicitation of comments would foster better relations, solve some persistent problems, and give industry a better understanding of defense needs.

A great source of frustration for industry is simply not knowing who to contact when problems, opportunities, and questions arise involving various commodities or documents. Non-Government standards committees also experience similar problems when they seek participation to develop standards. Both industry and non-Government standards bodies have expressed the need for a defense standardization directory to identify key players in the Department of Defense together with their telephone numbers, addresses, areas of responsibility, and any non-Government standards committees or industry associations in which they currently participate.

IV. ENHANCING DEFENSE STANDARDIZATION

The recommendations in this report, which have either been completed or are underway, are the result of input from participants from the Office of the Under Secretary of Defense (Acquisition), the Military Departments, and the Defense Logistics Agency who served on the Defense Standardization Study Team, as well as contributions from the Defense Standardization Council, the Departmental Standardization Offices, the Defense Science Board, industry associations, and non-Government standards bodies. Implementation of nearly all the recommendations is possible within the existing authority of the Department, but requires a political will and resource commitment that has been missing in the past. Since a few of the recommendations affect federal specifications and standards that are promulgated under the authority of the General Services Administration, their assistance is necessary for full implementation; as is the assistance of the National Institute of Standards and Technology of the Department of Commerce. Traditionally, both these organizations have been most cooperative, and we foresee no problem in obtaining their support.

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underway. . ."*

CONCLUSIONS AND RECOMMENDATIONS

The remaining portion of this section contains 12 conclusions and recommendations for action by the Department of Defense and other Government departments and agencies. The order of presentation generally corresponds with our six major thrusts: (1) establishing accountability within the Military Departments and Agencies for achieving program objectives; (2) conducting a comprehensive review of all specifications and standards to ensure they are in compliance with current Department of Defense policies; (3) establishing closer relationships with non-Government standards bodies and industry; (4) automating standardization data bases that serve as tools in the development, storage, retrieval, dissemination, application, and analysis of specifications and standards; (5) designating an executive agent to program and budget for special standardization projects; and (6) promoting expanded training for the developers and users of specifications and standards to effect the necessary cultural change.

Military Department and Agency Accountability

Conclusion

The Military Departments and Agencies do not have senior level standardization offices with enough authority and resources to enforce standardization document policy implementation, and there is little accountability.

Discussion

Department of Defense policies on specifications and standards are often times only paid *lip service* because each Military Department and Agency seems to lack an office with sufficient authority to enforce implementation of policy. Specification preparing activities are responsive to the goals set by their local commanders, and these do not necessarily support the corporate policy objectives, such as standardization. The excuse is frequently made that there are insufficient resources to implement policy. The resources are available, but as with all programs, there is fierce competition for those resources.

At present, the Departmental Standardization Offices for each Military Department and Agency are responsible for seeing that policies are implemented, and for translating policies into meaningful objectives for the individual activities within their component. The Departmental Standardization Offices are largely ineffective. They do not have enforcement authority, and their staffs are too small to work closely with their component activities to establish and monitor implementation of Military Department and Agency goals and objectives.

If we are to make significant improvements in our specifications and standards within a reasonable time frame, policies must be fully and rapidly implemented. To achieve this end, there must be authority and the political will to exercise that authority within each Military Department and Agency. The newly created Defense Standardization Council could provide the necessary authoritative leadership to ensure timely and thorough implementation of policies, but only if the members from each Military Department and Agency are in a position to mandate compliance.

Recommendations

The Military Departments and the Defense Logistics Agency will each designate an office and a standardization executive with sufficient authority to mandate compliance with standardization

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policies and to commit resources to implement these policies. These offices will also be responsible for establishing a Military Department/Agency policy implementation plan, and for providing the Under Secretary of Defense (Acquisition) with progress reports. The Department of Defense directive that establishes policy for the Defense Standardization Program will be revised to recognize this new chain of responsibility officially.

Reviewing Specifications and Standards

Conclusion

While most specifications and standards are adequate to meet the needs of the Department of Defense, there are thousands of documents that are either overage, contain obsolete technical requirements, may no longer be needed, are in the wrong document series, or contain overly restrictive requirements. In nearly all cases, these shortcomings are the result of not complying with standardization policies intended to prevent such occurrences.

Discussion

Government specifications and standards have been criticized for being obsolete, overage, overly restrictive, and not conducive to commercial acquisition. While some of this criticism is unjustified or misdirected, there is ample room for improvement. A review of the *Department of Defense Index of Specifications and Standards* demonstrates there are about 7,200 overage documents for which appropriate corrective action has not been initiated; there are duplicative documents that could be combined or eliminated; there are military specifications and standards that could be replaced by non-Government standards or commercial item descriptions; there are several documents that have been in interim status for years and need to be fully coordinated; and there are many documents that have been improperly designated as specifications, standards, or some other type of document.

Program plans are an underutilized tool that can be used to plan for the replacement of Government documents with non-Government standards, the consolidation or elimination of duplicative documents, and to establish agreements for future document development. Program plans need to be better written, resources need to be committed to fulfill the commitments in the plan, and there must be continual monitoring by the lead standardization activities and the Departmental Standardization Offices to ensure implementation of the plan.

Military specifications should be used only to acquire items that have unique military applications. For items that are commercial products, non-Government standards, commercial item descriptions, federal specifications, and multiple award schedules should be the preferred acquisition vehicles.

Recommendations

"The Military Departments and Agencies will review each Government document. . ."

The Military Departments and Agencies will review each Government document for which they are the proponent to determine if the document: is current or in need of being updated; covers an obsolete item and should be canceled or inactivated for new design; describes a commercial product, and should be replaced by a non-Government standard, commercial item description, federal specification, or multiple award schedule; is in interim status and requires immediate coordination; duplicates existing documents and could be combined or eliminated; and is properly identified as a specification, standard, or handbook. Upon submission of this report, the Military Departments and Agencies will submit an action plan within 180 days to the Under Secretary of Defense (Acquisition) indicating corrective measures and milestones. Any Government document which has not been reviewed and appropriate action indicated will be canceled.

A change to the *Defense Standardization Manual* will be issued to improve the quality of program plans, and enlist the support of the members of the Defense Standardization Council to ensure the resources and commitment to implement the tasks in the plan.

A meeting with the General Services Administration will be arranged to discuss the effect of these recommendations on federal specifications and standards, and to seek authorization for the Department of Defense to cancel and supersede federal specifications and standards with their concurrence.

"All existing interim documents will be either canceled or coordinated immediately."

All existing interim documents will be either canceled or coordinated immediately. A sunset clause will be mandated to appear on all future interim documents that will automatically cancel the document at the end of two years.

Living Specifications

Conclusion

The present approach to developing military specifications is not always responsive to the user's needs, and does not encourage vendors to supply the most current state-of-the-art items. Supplying

products to the traditional military specification requires only meeting the specified requirements, and there is little incentive to do better or to produce better quality products. Work needs to be done to develop a *living specification* that will be more flexible, more responsive to the user's needs, and more adaptable to changes in technology.

Discussion

In order to change the traditional approach to military specifications, we need to pursue the concept of a *living specification*, which is defined as a formatted document that allows for rapid insertion of new technology, permits the use of advanced manufacturing process techniques, and promotes continuous quality improvement without the need of major revisions or updates to the specification. *Living specifications* might assume a variety of appearances, such as a performance specification or a *fill-in-the-blank* guide specification.

We must avoid needlessly expanding the traditional quality control inspection program. We have a tendency to add more testing in order to correct various quality related problems. This approach has contributed to a decline in competitiveness. There is a need to seek out and correct the root cause of the problems, and to design and manufacture quality into the product. The *living specification* supports implementation of the Department's total quality management program that includes such tools as statistical process control for reducing reliance on end-of-line product inspection. Full implementation of the qualified manufacturers list program is essential to the *living specification* concept. This program will allow the Department to work with manufacturers and recognize their process capabilities through accreditation and certification, and rely on their certified manufacturing processes, provided the product conforms to the specified performance requirements.

It is recognized the *living specification* approach is not applicable in all cases, particularly in procurement specifications where exact design interfaces may be critical, but action needs to be taken to break free from past solutions that will no longer satisfy the user's needs in today's fast-moving, high-technology environment.

Recommendations

Each Military Department will identify 25 high-technology candidate specifications that will be revised under a pilot program to reflect the concepts of the *living specification*. The specifications generated under this pilot program can be used as models to create

"Each Military Department will identify 25 high-technology candidate specifications that will be revised under a pilot program to reflect the concepts of the living specification."

"...policy for the establishment of qualified manufacturers lists will be developed, coordinated, and issued."

living specifications for other moderate to high technology commodities. In support of this action, policy for the establishment of qualified manufacturers lists will be developed, coordinated, and issued.

Non-Government Standards

Conclusion

There is much potential to increase the number of non-Government standards adopted by the Department of Defense to replace military specifications and standards. Greater reliance on non-Government standards would expand the Department's acquisition of commercial products and processes, thus saving money, reducing lead time, improving quality, and bolstering our defense industrial competitiveness.

Discussion

One major obstacle facing the Department of Defense in its efforts to adopt non-Government standards is the lack of product standards. Those non-Government standards bodies with which the Department is most involved support the idea of developing more product standards, but such standards are not being developed quickly enough for a number of reasons. Consistent participation by Department personnel on the technical committees that generate the standards is often limited because of restrictions on travel funds and because work on non-Government standards is considered less important than military documents. Another problem is that manufacturers on technical committees sometimes oppose the development of product standards since they might exclude their product, or level the playing field, making product differences that are now marketed as selling points less important.

There is also some question about the Department's commitment to using non-Government standards since there is usually considerable delay in adopting a standard. In part, this delay is the result of a complex, bureaucratic adoption process that could be simplified while still protecting the Department's interests. Usually, adoption is a fairly time-consuming process demanding a modest amount of resources. When a defense activity determines that a non-Government standard is suitable for adoption, a one-page adoption notice is prepared, coordinated for 60 to 90 days, differing comments are resolved, and finally, the document may be adopted. The whole process can take anywhere from 3 months to a year, and when the originating non-Government standards body revises the document, the revised document must be adopted again using the same proce-

dures.

This cumbersome process causes delays in adoption and, in some cases, discourages adoption. Because of time lags to readopt revised documents, it is common for a standard listed as adopted by the Department of Defense not to be the most current issue. To encourage the rapid adoption of the most current issue of a non-Government standard, we propose to eliminate the formal adoption notice and coordination. Instead, a standardization management activity would act as a proponent to determine the adequacy of a non-Government standard for use within the Department of Defense. The proponent would be encouraged to circulate the draft standard throughout the Department as part of the normal coordination process for that non-Government standards body, but no coordination would occur after approval of the standard. Instead of an adoption notice, the proponent's name and address would appear on the first page of the standard as the focal point for the Department of Defense, and the standard would be indexed in the *Department of Defense Index of Specifications and Standards*. Once adopted by the Department, all future updates to a non-Government standard would automatically be adopted. Acceptance of a non-Government standard would be perpetual, unless a withdrawal of interest notice were issued by the proponent.

Recommendations

The adoption process will be simplified to encourage the use of non-Government standards and lessen the administrative burden on the standardization management activities by eliminating the need for formal coordination and for the readoption of future revisions to a non-Government standard.

The Departmental Standardization Offices and standardization executives will be responsible for ensuring consistent Department of Defense participation on non-Government standards committees.

Automation

Conclusion

Automation is the key to improving the development, storage, retrieval, dissemination, application, and analysis of specifications, standards, and other standardization documents. Without automation, managers and users will not have meaningful information provided on a timely basis.

"The adoption process will be simplified to encourage the use of non-Government standards. . ."

Discussion

The standardization world has been slow to take advantage of automation to improve document productivity and usefulness. The newly operational Print On Demand System is a major step forward in the storage, retrieval, and dissemination of specifications and standards, but much remains to be done. A Standardization Automation Users Panel met for the first time in July 1988 to explore various ways to improve standardization through automation and to select an administrator to manage the future data bases. A study team is visiting various isolated islands of automation that support standardization on a limited basis to determine if their applications could be expanded and made available throughout the Department of Defense.

Recommendations

"The Standardization Automation Users Panel will develop a plan to automate the various functional requirements of the Defense Standardization Program."

The Standardization Automation Users Panel will develop a plan to automate the various functional requirements of the Defense Standardization Program. As a minimum, the Panel will consider the following for automation: the *Department of Defense Index of Specifications and Standards*, the standardization directory, the status of standardization projects, automatic coordination, document transmission to the Department of Defense Single Stock Point, key word searches, full text access, a specifications and standards tiering data base, and a standardization bulletin board. The Standardization Automation Users Panel will also work closely with the Computer Aided Acquisition and Logistics Support office to ensure compatibility with their efforts, and to develop an interface with industry that reduces duplicative generation and maintenance of data, thus eliminating the requirements for expensive paper output and reentry of data.

The Standardization Automation Users Panel will consider alternatives to the Department of Defense Single Stock Point as the administrator for these data bases, and assess both location and control of future automated data bases.

Training

Conclusion

Widespread and properly tailored training is essential if the Department of Defense is to refrain from issuing excessive military specifications, and consider developing and using alternatives, such

as non-Government standards and multiple award schedules. Training is also needed to improve the effectiveness of the management of the Defense Standardization Program.

Discussion

There is not enough training available to satisfy the needs of specifications and standards developers and users. The primary course available is the Defense Specification Management Course taught by the Army Logistics Management College, which can only accept a limited number of students and concentrates primarily on the needs of the specification writer to develop and manage military specifications. Courses are needed to address alternatives to military specifications and standards. Specialized training modules should be developed to address the peculiar needs of the users of standardization documents, such as those involved in logistics, quality assurance, packaging, engineering, and library science. Personnel must be better trained to carry out their management responsibilities as a lead standardization activity. With its many training sites and capabilities, the Defense Systems Management College would be a likely candidate to assign the development of these new courses.

Recommendations

The Defense Systems Management College will be assigned the task to develop training courses that are better suited for targeted audiences, that more closely reflect current policies on document development and preference for use, and that address management responsibilities within the Defense Standardization Program. The Army Logistics Management College will modify its existing specification course to place less emphasis on the development of military specifications, and more emphasis on such alternatives as non-Government standards, commercial item descriptions, and multiple award schedules.

Funding

Conclusion

An executive agent needs to be designated to program and budget funds to be used by the Military Departments and Agencies to accomplish special standardization projects.

"The Defense Systems Management College will be assigned the task to develop training courses. . ."

"The Army Logistics Management College will modify its existing specification course. . ."

Discussion

In general, standardization management activities are funded from operations and maintenance funds to accomplish certain command objectives, or they are funded from other sources to complete a specific task. While certain projects are well served by this funding method, broad corporate objectives serving the Department of Defense as a whole frequently are not. Examples of corporate standardization activities that could be enhanced by additional centralized funding include the development of metric standards to ensure greater interoperability with our allies, joint projects with non-Government standards bodies to develop world class standards, and automation. In order to make standardization management activities more responsive to corporate defense standardization objectives, a single Military Department or Agency needs to be assigned as the executive agent and directed to program and budget money for corporate standardization activities.

"Designate a single Military Department or Agency to program and budget funds as the executive agent for Defense Standardization Program special projects."

Recommendation

Designate a single Military Department or Agency to program and budget funds as the executive agent for Defense Standardization Program special projects.

Forging the Right Relations With Industry

Conclusion

By improving the interface between the standardization management activities and industry associations and non-Government standards bodies, the Department of Defense can forge the right relationships with industry and take advantage of their resources to improve our specifications and standards.

Discussion

While relations between standardization management activities and industry are good, they can be improved. One great source of frustration for industry is simply not knowing who to contact in the Department of Defense when problems, opportunities, and questions arise involving various commodities or documents. Non-Government standards committees also experience similar problems when they seek defense participation to develop standards. What is needed is an easy to use directory identifying the key players in the Department, together with their phone numbers, addresses, commodity

areas, and any non-Government standards bodies or industry associations in which they participate.

To be successful in improving the existing specifications and standards, the Department of Defense needs to take advantage of the potential services that could be provided by industry associations and non-Government standards bodies. These organizations could be used to conduct surveys, create small working groups to address specific issues, and get a better pulse on whether problems we hear about affect an entire industry or just a company within that industry. There should also be regularly scheduled meetings with the major multi-industry associations to address policy issues and problems with defense acquisition documents. This would foster better relations, solve some persistent problems, and give industry a better understanding of defense needs.

Recommendations

The Director, Standardization and Data Management will establish regular meetings with the major industry associations to identify and solve problems with specifications and standards used by the Department of Defense. Industry associations will be used to conduct surveys of their members, and create special task groups to solve specific issues. A standardization directory will be prepared to help industry and non-Government standards bodies identify the proper people to serve on technical committees and address standardization problems and opportunities.

"A standardization directory will be prepared. . ."

Feedback on Specifications and Standards

Conclusion

To identify more effectively those specifications and standards containing redundant, conflicting, technically obsolete, and restrictive requirements, there must be more feedback from the users of these documents.

Discussion

Nearly all military specifications and standards give the address of the preparing activity for the document, and encourage comments either by letter or via the Standardization Document Improvement Proposal Form that is attached to the back of the document. Despite this encouragement, the number of comments received annually tends to be small. There are several reasons for such meager feedback. Some users either do not have the time or inclination to fill out a form or

"The Standardization Document Improvement Proposal Form will be revised. . ."

write a letter. Others complain they never receive a response to their comments, or that the response avoids consideration of the comment until the next time the document is updated. More feedback might be received if the telephone number of the preparing activity was included on the Standardization Document Improvement Proposal Form. To ensure the correct preparing activity receives the comment and provides an adequate response in a timely manner, a central control point to process the forms could be established.

Recommendations

The Standardization Document Improvement Proposal Form will be revised to include the telephone number of the preparer and a self-addressed focal point that will be responsible for ensuring a timely and adequate response.

Reporting Standardization Accomplishments

Conclusion

The image of specifications and standards could be enhanced by improving the quality of the annual Standardization Accomplishment Report. The report could also serve as a gauge to measure the effectiveness of the Military Departments and Agencies in meeting policy goals and objectives.

Discussion

The primary reporting mechanism for standardization accomplishments is the annual Standardization Accomplishment Report, which could be a useful tool to measure our progress towards certain goals. Past reports provided statistics on numbers of documents developed, updated, and canceled; there was some required information on avionics standardization and the parts control program; and the Military Departments/Agencies would report on accomplishments from their individual activities. To a large extent, the report rambled, lacked focus, and the accomplishments seldom reflected those of the entire Military Department or Agency.

The annual Standardization Accomplishment Report should be revitalized to measure our progress. Each year, the Office of the Secretary of Defense should work with the Military Departments and Agencies to establish goals against which progress will be reported. The annual report should also contain general statistical data and the top five significant accomplishments for the entire Military Department or Agency.

Recommendation

The format and required information from the Military Departments and Agencies for the fiscal year 1989 Standardization Accomplishment Report will be changed to provide more concise and meaningful data. This change will be incorporated into the *Defense Standardization Manual*.

Department of Defense Index of Specifications and Standards

Conclusion

Misconceptions about military specifications and standards are often the result of misunderstanding the format and content of the *Department of Defense Index of Specifications and Standards*.

Discussion

Many people who examine the *Department of Defense Index of Specifications and Standards* conclude incorrectly that all the documents listed are specifications and standards prepared by and for the Department of Defense. Based on the title of the *Index*, this conclusion is logical, but in fact, there are thousands of documents listed that are not specifications or standards, and there are thousands of documents prepared by either non-Government standards bodies or the General Services Administration.

To correct this misconception, the *Index* should be changed to the *Federal Index of Specifications and Standards*, and divided into three volumes: a listing of federal documents, such as federal specifications and standards, commercial item descriptions, and federal information processing standards; a listing of uniquely military documents; and a listing of adopted non-Government standards. Although the Department of Defense Single Stock Point could maintain such an *Index*, it might be more appropriate to examine if the National Institute of Standards and Technology would be willing to accept this responsibility.

Within the proposed listing of uniquely military documents, military specifications should be segregated into reprourement and development documents. The Department is sometimes criticized for specifications that give explicit design detail. Such criticism is valid in the case of development, and it may be valid for reprourement, but we need to acknowledge there are reprourement situations where it is necessary to provide explicit design specifications.

***". . .the fiscal year
1989 Standardization
Accomplishment
Report will be
changed to provide
more concise and
meaningful data."***

"The Department of Defense Index of Specifications and Standards will be reformatted . . . and the National Institute of Standards and Technology will be asked to maintain the reformatted Index."

Another problem with the *Department of Defense Index of Specifications and Standards* is the large number of errors in it. It will be a laborious undertaking to verify the accuracy of the *Index*, but given its legal importance in contractual matters, it is a necessary task.

Recommendations

The *Department of Defense Index of Specifications and Standards* will be reformatted to convey better the types of documents used in the Defense Standardization Program. The Military departments and Agencies will review the *Index* for accuracy and make the necessary corrections, and the National Institute of Standards and Technology will be asked to maintain the reformatted *Index*.

Lead Standardization Activity Responsibilities

Conclusion

The lead standardization activities are not adequately fulfilling their functions in the way they manage federal supply classes and standardization areas.

Discussion

A lead standardization activity is responsible for managing the standardization documents under a specific federal supply class or standardization area (see Appendix A for a listing of lead standardization activities). In this role, a lead standardization activity assigns project numbers authorizing the development, update, adoption, and cancellation of standardization documents to prevent duplicative efforts and ensure adherence to policy. It is also responsible for developing and monitoring program plans to identify standardization problems and opportunities, to prioritize standardization efforts, and to assign tasks within the Military Departments and Agencies.

While the *Defense Standardization Manual* establishes the lead standardization activity's responsibilities and authorities, there is much inconsistency in the way they translate their responsibilities into practice. Some lead standardization activities challenge requests to develop or change a standardization document; but most routinely approve the requests. Some use the program plan as a blueprint for the future; but others either ignore their responsibility or issue meaningless plans that fulfill the letter, but not the spirit of the requirement. Part of the problem might be that the lead standardization activities were identified over 30 years ago, and at least in some cases, they may no longer have the dominant technical capability or interest to enable

them to do a good job. There should be a review of all the lead standardization activity assignments to ensure that each federal supply class and standardization area is managed by the proper activity. Consideration should also be given to designating a civilian agency as a lead standardization activity. For example, the General Services Administration has the Government's technical expertise for hand tools and prepares the vast majority of hand tool specifications and standards used by the Department of Defense. If they agree, the General Services Administration would seem the logical lead standardization activity for the hand tools federal supply classes.

Recommendations

The current lead standardization activity assignments will be reevaluated for appropriateness, and reassigned as necessary. In addition, the lead standardization activity will be required to complete a project questionnaire before authorizing the development or update of any specification or standard to ensure the need for the document and compliance with standardization policies. Such a questionnaire will document management decisions, and will provide a permanent record to audit these decisions.

"The current lead standardization activity assignments will be reevaluated for appropriateness, and reassigned as necessary."

POSTSCRIPT

By Dr. Robert B. Costello

Undersecretary of Defense (Acquisition)

A number of good ideas surfaced as the research for this report was conducted, and we chose to act upon them rather than await final publication of the report. Some of the recommendations already are ongoing within the Department. For example, each Military Department and the Defense Logistics Agency have designated a standardization executive who is responsible for ensuring adequate resources are committed to comply with Department standardization policies. The standardization executive will also report to the Defense Standardization Council, which had its first meeting last May, on the progress of meeting certain standardization goals and objectives, such as eliminating military specifications for commercial products and using non-Government standards. To reflect this organizational change of responsibility, a revised directive on the *Defense Standardization Program* is undergoing final coordination.

To reduce significantly the future development and updating of military specifications for commercial products, the Military Departments and Agencies have been prohibited from issuing or revising military specifications in nearly 400 federal supply classes where there is a high potential for commercial acquisition, unless a specific waiver is granted (see Appendix B for a listing of applicable federal supply classes).

Multiple award schedules are attractive alternatives for complex commercial items currently bought to military specifications. The Department does have some limited experience using these schedules to buy certain petroleum products and subsistence items, but we are seeking to broaden this practice. Within the restrictions placed on using multiple award schedules by the *Federal Acquisition Regulations*, each Military Department has been directed to identify 25 families of products normally procured centrally for the Department of Defense that could be bought using multiple award schedules. Upon receipt of this input, the Defense Logistics Agency will be directed to obtain the necessary authority from the General Services Administration to establish the multiple award schedules for the designated commodities.

Several steps have been taken to increase the number of non-Government standards adopted and used by the Department. In early

"...the Military Departments and Agencies have been prohibited from issuing or revising military specifications in nearly 400 federal supply classes where there is a high potential for commercial acquisition. . ."

"...each Military Department has been directed to identify 25 families of products normally procured centrally for the Department of Defense that could be bought using multiple award schedules."

July, I met personally with the presidents of several major standards writing organizations to seek their support in developing more product standards that can be used by the Department in acquisition. They were receptive to the idea, provided the Department will do its fair share and participate in the technical committee meetings, contribute to writing some of the standards, and most importantly, adopt and use the standards once they are developed.

"...we have initiated procedural changes that will simplify the adoption process..."

"...the General Services Administration is...agreeable to authorizing the Department of Defense to cancel and supersede federal documents..."

"A memorandum of understanding is being drafted..."

To encourage greater use and adoption of non-Government standards, we have recently revised the Department of Defense Directive on the *Development and Use of Non-Government Standards* to require not only the use of existing non-Government standards instead of military and federal specifications and standards, but to work with the non-Government standards bodies to revise or develop standards as replacements for our documents. In addition, we have initiated procedural changes that will simplify the adoption process, thus encouraging more adoptions of non-Government standards and saving thousands of man-hours annually by alleviating administrative burdens.

Since the support of the General Services Administration is necessary in replacing federal specifications and standards with non-Government standards, we have met with them and they seem agreeable to authorizing the Department of Defense to cancel and supersede federal documents, provided proper coordination safeguards are developed and followed. A memorandum of understanding is being drafted, and policy included in the *Defense Standardization Manual*.

To improve program planning for specifications and standards, a change to the *Defense Standardization Manual* has been issued. Less emphasis will be placed on the analysis of statistics, and more attention will be given to establishing tasks and milestones, and committing the resources to meet stated objectives.

We have also made initial progress in several other areas. The Standardization Automation Users Panel held its first meeting in July to identify potential systems that would benefit from automation. They have plans to visit a number of Government and private sector sites to investigate existing automation capabilities, to conduct equipment surveys, to conduct interviews at several of the major standardization management activities, and eventually, to develop an automation plan for implementation by the Military Departments and Agencies. We have also taken steps to improve the management effectiveness of the lead standardization activities by developing a draft of a project questionnaire for coordination, and we are reevalu-

ating the assignments of federal supply classes and standardization areas. To improve feedback and responsiveness to the feedback, a new Standardization Document Improvement Proposal Form and associated procedures are being coordinated and will soon be implemented.

Specifications and standards are the cornerstones of quality. This is readily apparent in light of the new definition for quality within the Department of Defense: *Conformance to correctly defined requirements satisfying the customer's needs*. Without specifications and standards that are technologically current, are flexible enough to allow for innovation, take advantage of the commercial marketplace, encourage continuous quality improvement, and most importantly, meet the user's needs, it is not possible to have quality. The concept of total quality management involves the whole product life cycle, but it begins with the establishment of quality requirements.

"Specifications and standards are the cornerstones of quality."

For there to be a significant improvement in our specifications and standards, two things must occur. First, management must accept responsibility for ensuring that policies are fully implemented. Second, there needs to be a more cooperative and effective relationship between the Military Departments and Agencies, with industry, with non-Government standards bodies, and with other federal agencies. Although it will not be easy, the climate is right for a cultural change, and the potential is great for more efficiency, higher quality, reduced costs, and better support for our defense industrial competitiveness. The efforts documented in this report reflect the Department of Defense's commitment to follow through with these recommendations.

APPENDIX A

Lead Standardization Activities

DEPARTMENT OF THE ARMY

Armament, Munitions and Chemical Command, Picatinny Arsenal
Armament, Munitions and Chemical Command, Rock Island
Armament, Munitions and Chemical Command, Aberdeen Proving
Ground
Aviation Systems Command
Belvoir Research, Development and Engineering Center
Communications-Electronics Command
Materials Technology Laboratory
Materiel Readiness Support Activity
Missile Command
Natick Research, Development and Engineering Center
Packaging, Storage and Containerization Center
Tank-Automotive Command
Test and Evaluation Command

DEPARTMENT OF THE NAVY

Naval Air Systems Command
Naval Facilities Engineering Command
Naval Sea Systems Command (Ordnance Systems)
Naval Sea Systems Command (Ship Systems)
Space and Naval Warfare Systems Command

DEPARTMENT OF THE AIR FORCE

Aeronautical Systems Division
Cataloging and Standardization Center
Command, Control, Communications and Computer Systems
Command Standardization Office, Air Force Systems Command
Directorate of Energy Management
Packaging Evaluation Agency
Rome Air Development Center
Space Division
Technical Information Support Systems Development Branch

DEFENSE LOGISTICS AGENCY

Defense Construction Supply Center
Defense Electronics Supply Center
Defense Fuel Supply Center
Defense General Supply Center
Defense Industrial Plant Equipment Center
Defense Industrial Supply Center
Defense Personnel Support Center

OTHER DEFENSE AGENCIES AND OFFICES

Defense Communications Agency
Defense Data Management Office
Defense Nuclear Agency
Defense Product Standards Office
Defense Standardization Program Office
Joint Tactical Command, Control and Communications Agency
National Security Agency

APPENDIX B

Federal Supply Classes With Commercial Potential

The following federal supply classes predominantly apply to commercial products and processes, and accordingly, non-Government standards and commercial item descriptions should be used to document these requirements. Military documents in these federal supply classes may be issued or updated only for intrinsically military items, and the preparing activity for the military document must obtain concurrence from the appropriate Departmental Standardization Office and approval from the appropriate standardization executive.

FEDERAL SUPPLY CLASS AND TITLE

1375, Demolition Materials
1920, Fishing Vessels
2010, Ship and Boat Propulsion Components
2020, Rigging and Rigging Gear
2030, Deck Machinery
2040, Marine Hardware and Hull Items
2050, Buoys
2060, Commercial Fishing Equipment
2090, Miscellaneous Ship and Marine Equipment
2210, Locomotives
2220, Rail Cars
2230, Right-of-Way Construction and Maintenance Equipment,
Railroad
2240, Locomotive and Rail Car Accessories and Components
2250, Track Materials, Railroad
2310, Passenger Motor Vehicles
2320, Trucks and Truck Tractors, Wheeled
2330, Trailers
2340, Motorcycles, Motor Scooters, and Bicycles
2410, Tractors, Full Track, Low Speed
2420, Tractors, Wheeled
2430, Tractors, Track Laying, High Speed
2510, Vehicular Cab, Body and Frame Structural Components
2520, Vehicular Power Transmission Components
2530, Vehicular Brake: Steering, Axle, Wheel and Track
Components
2540, Vehicular Furniture and Accessories
2590, Miscellaneous Vehicular Components
2610, Tires and Tubes, Pneumatic, Except Aircraft

2620, Tires and Tubes, Pneumatic, Aircraft
2630, Tires, Solid and Cushion
2640, Tire Rebuilding and Tire and Tube Repair Materials
2920, Engine Electrical System Components, Nonaircraft
2930, Engine Cooling System Components, Nonaircraft
2940, Engine Air and Oil Filters, Strainers, and Cleaners, Nonaircraft
2990, Miscellaneous Engine Accessories, Nonaircraft
3010, Torque Converters and Speed Changers
3020, Gears, Pulleys, Sprockets, and Transmission Chains
3030, Belting Driving Belts, Fan Belts and Accessories
3040, Miscellaneous Power Transmission Equipment
3210, Sawmill and Planning Mill Machinery
3220, Woodworking Machines
3230, Tools and Attachments for Woodworking Machinery
3405, Saws and Filing Machines
3408, Machining Centers and Way-Type Machines
3410, Electrical and Ultrasonic Erosion Machines
3411, Boring Machines
3412, Broaching Machines
3413, Drilling and Tapping Machines
3414, Gear Cutting and Finishing Machines
3415, Grinding Machines
3416, Lathes
3417, Milling Machines
3418, Planners and Shapers
3419, Miscellaneous Machine Tools
3422, Rolling Mills and Drawing Machines
3510, Laundry and Dry Cleaning Equipment
3520, Shoe Repairing Equipment
3530, Industrial Sewing Machines and Mobile Textile Repair Shops
3540, Wrapping and Packaging Machinery
3550, Vending and Coin Operated Machines
3590, Miscellaneous Military Department and Trade Equipment
3605, Food Products Machinery and Equipment
3610, Printing, Duplicating and Bookbinding Equipment
3611, Industrial Marking Machines
3615, Pulp and Paper Industries Machinery
3620, Rubber and Plastics Working Machinery
3625, Textile Industries Machinery
3630, Clay and Concrete Products Industries Machinery
3635, Crystal and Glass Industries Machinery
3640, Tobacco Manufacturing Machinery
3645, Leather Tanning and Leather Working Industries Machinery
3650, Chemical and Pharmaceutical Products Manufacturing
Machinery
3655, Gas Generating and Dispensing Systems, Fixed or Mobile

3660, Industrial Size Reduction Machinery
3670, Special Semiconductor Microelectronic Circuit Device Printed
Circuit Board Manufacturing Machinery
3680, Foundry Machinery, Related Equipment and Supplies
3685, Specialized Metal Container Manufacturing Machinery and
Related Equipment
3693, Industrial Assembly Machines
3694, Clean Work Stations, Controlled Environment and Related
Equipment
3710, Soil Preparation Equipment
3720, Harvesting Equipment
3730, Dairy, Poultry and Livestock Equipment
3740, Pest, Disease and Frost Control Equipment
3750, Gardening Implements and Tools
3760, Animal Drawn Vehicles and Farm Trailers
3770, Saddlery, Harness, Whips and Related Animal Furnishings
3805, Earth Moving and Excavating Equipment
3810, Cranes and Crane Shovels
3815, Crane and Crane Shovel Attachments
3820, Mining, Rock Drilling, Earth Boring and Related Equipment
3825, Road Clearing and Cleaning Equipment
3830, Truck and Tractor Attachments
3835, Petroleum Production and Distribution Equipment
3895, Miscellaneous Construction Equipment
3910, Conveyors
3920, Materials Handling Equipment, Non Self Propelled
3930, Warehouse Trucks and Tractors Self Propelled
3940, Blocks, Tackle, Rigging and Slings
3950, Winches, Hoist, Cranes and Derricks
3960, Elevators and Escalators
3990, Miscellaneous Materials Handling Equipment
4010, Chain and Wire Rope
4020, Fiber Rope, Cordage and Twine
4030, Fittings for Rope, Cable and Chain
4110, Refrigerating Equipment
4120, Air Conditioning Equipment
4130, Refrigeration and Air Conditioning Components
4140, Fans, Air Circulators and Blower Equipment
4210, Fire Fighting Equipment
4220, Marine Lifesaving and Diving Equipment
4230, Decontaminating and Impregnating Equipment
4240, Safety and Rescue Equipment
4310, Compressors and Vacuum Pumps
4320, Power and Hand Pumps
4330, Centrifugals, Separators, and Press and Vacuum Filters
4410, Industrial Boilers

4420, Heat Exchangers and Steam Condensers
4430, Industrial Furnaces Kilns, Lehrs and Ovens
4440, Driers, Dehydrators and Anhydrators
4460, Air Purification Equipment
4510, Plumbing Fixtures and Accessories
4520, Space Heating Equipment and Domestic Water Heaters
4530, Fuel Burning Equipment Units
4540, Miscellaneous Plumbing, Heating and Sanitation Equipment
4610, Water Purification Equipment
4620, Water Distillation Equipment, Marine and Industrial
4630, Sewage Treatment Equipment
4710, Pipe and Tube
4720, Hose and Tubing, Flexible
4730, Fittings and Specialties, Hose, Pipe and Tube
4810, Valves, Powered
4820, Valves, Nonpowered
5110, Hand Tools, Edged, Nonpowered
5120, Hand Tools, Nonedged, Nonpowered
5130, Hand Tools, Power Driven
5133, Drill Bits, Counterbores and Countersinks, Hand and Machine
5136, Taps, Dies and Collets, Hand and Machine
5140, Tool and Hardware Boxes
5180, Sets, Kits and Outfits of Hand Tools
5210, Measuring Tools, Craftsmans'
5220, Inspection Gages and Precision Layout Tools
5280, Sets, Kits and Outfits of Measuring Tools
5305, Screws
5306, Bolts
5307, Studs
5310, Nuts and Washers
5315, Nails, Keys and Pins
5320, Rivets
5325, Fastening Devices
5330, Packing and Gasket Materials
5335, Metal Screening
5340, Miscellaneous Hardware
5345, Disks and Stones, Abrasive
5350, Abrasive Materials
5355, Knobs and Pointers
5360, Coil, Flat and Wire Springs
5365, Rings, Shims and Spacers
5410, Prefabricated and Portable Buildings
5411, Rigid Walled Shelters
5430, Storage Tanks
5440, Scaffolding Equipment and Concrete Forms
5445, Prefabricated Tower Structures

5450, Miscellaneous Prefabricated Structures
5510, Lumber and Related Basic Wood Materials
5520, Millwork
5530, Plywood and Veneer
5610, Mineral Construction Materials, Bulk
5620, Building Glass, Tile, Brick, and Block
5630, Pipe and Conduit, Nonmetallic
5640, Wallboard, Building Paper and Thermal Insulation Materials
5650, Roofing and Siding Materials
5660, Fencing, Fences, and Gates
5670, Architectural and Related Metal Products
5680, Miscellaneous Construction Materials
5805, Telephone and Telegraph Equipment
5815, Teletype and Facsimile Equipment
5820, Radio and Television Communication Equipment, Except
 Airborne
5835, Sound Recording and Reproducing Equipment
6105, Motors, Electrical
6110, Electrical Control Equipment
6115, Generators and Generator Sets, Electrical
6116, Fuel Cell Power Units, Components and Accessories
6120, Transformers, Distribution and Power Station
6125, Converters, Electrical, Rotating
6130, Converters, Electrical, Nonrotating
6135, Batteries, Non-Rechargeable
6140, Batteries, Rechargeable
6150, Miscellaneous Electric Power and Distribution Equipment
6210, Indoor and Outdoor Lighting Fixtures
6220, Electric Vehicular Lights and Fixtures
6230, Electric Portable and Hand Lighting Equipment
6240, Electric Lamps
6250, Ballasts, Lampholders and Starters
6260, Nonelectrical Lighting Fixtures
6310, Traffic and Transit Signal Systems
6320, Shipboard Alarm and Signal Systems
6330, Railroad Signal and Warning Devices
6340, Aircraft Alarm and Signal Systems
6350, Miscellaneous Alarm and Signal Systems
6505, Drugs, Biologicals and Official Reagents
6508, Medicated Cosmetics and Toiletries
6510, Surgical Dressing Materials
6515, Medical and Surgical Instruments, Equipment and Supplies
6520, Dental Instruments, Equipment and Supplies
6525, X-Ray Equipment and Supplies, Medical, Dental and
 Veterinary
6530, Hospital Furniture, Equipment, Utensils and Supplies

6532, Hospital and Surgical Clothing and Related Special Purpose Items
6540, Opticians' Instruments, Equipment and Supplies
6545, Medical Sets, Kits and Outfits
6550, In-Vitro Diagnostic Substances, Reagents, Test Kits and Sets
6625, Electrical and Electronic Properties Measuring and Testing Instruments
6630, Chemical Analysis Instruments
6635, Physical Properties Testing Equipment
6636, Environmental Chambers and Related Equipment
6640, Laboratory Equipment and Supplies
6645, Time Measuring Instruments
6650, Optical Instruments
6655, Geophysical and Astronomical Instruments
6660, Meteorological Instruments and Apparatus
6665, Hazard-detecting Instruments and Apparatus
6670, Scales and Balances
6675, Drafting, Surveying and Mapping Instruments
6680, Liquid and Gas Flow, Liquid Level and Mechanical Motion Measuring Instruments
6685, Pressure, Temperature and Humidity Measuring and Controlling Instruments
6695, Combination and Miscellaneous Instruments
6710, Cameras, Motion Picture
6720, Cameras, Still Picture
6730, Photographic Projection Equipment
6740, Photographic Developing and Finishing Equipment
6750, Photographic Supplies
6760, Photographic Equipment and Accessories
6770, Film, Processed
6780, Photographic Sets, Kits and Outfits
6810, Chemicals
6820, Dyes
6830, Gases, Compressed and Liquefied
6840, Pest Control Agents and Disinfectants
6850, Miscellaneous Chemical Specialties
6910, Training Aids
6920, Armament Training Devices
6930, Operational Training Devices
6940, Communication Training Devices
7030, ADP Software
7035, ADP Support Equipment
7040, Punched Card Equipment
7042, Mini and Micro Computer Control Devices
7045, ADP Supplies and Support Equipment
7050, ADP Components

7105, Household Furniture
7110, Office Furniture
7125, Cabinets, Lockers, Bins and Shelving
7195, Miscellaneous Furniture and Fixtures
7210, Household Furnishings
7220, Floor Coverings
7230, Draperies, Awnings and Shades
7240, Household and Commercial Utility Containers
7290, Miscellaneous Household and Commercial Furnishings and Appliances
7310, Food Cooking, Baking and Serving Equipment
7320, Kitchen Equipment and Appliances
7330, Kitchen Hand Tools and Utensils
7340, Cutlery, Flatware
7350, Tableware
7360, Sets, Kits, Outfits, Food Preparation and Servings
7420, Accounting and Calculating Machines
7430, Typewriters and Office-Type Composing Machines
7435, Office Information System Equipment
7450, Office Type Sound Recording and Reproducing Machines
7460, Visible Record Equipment
7490, Miscellaneous Office Machines
7510, Office Supplies
7520, Office Devices and Accessories
7530, Stationery and Record Forms
7540, Standard Forms
7610, Books and Pamphlets
7630, Newspapers and Periodicals
7640, Maps, Atlases, Charts and Globes
7650, Drawings and Specifications
7660, Sheet and Book Music
7670, Microfilm, Processed
7690, Miscellaneous Printed Matter
7710, Musical Instruments
7720, Musical Instrument Parts and Accessories
7730, Phonographs, Radios and Television Sets, Home Type
7740, Phonograph Records
7810, Athletic and Sporting Equipment
7820, Games, Toys and Wheeled Goods
7830, Recreational and Gymnastic Equipment
7910, Floor Polishers and Vacuum Cleaning Equipment
7920, Brooms, Brushes, Mops and Sponges
7930, Cleaning and Polishing Compounds and Preparations
8010, Paints, Dopes, Varnishes and Related Products
8020, Paint and Artists' Brushes
8030, Preservative and Sealing Compounds

8040, Adhesives
8105, Bags and Sacks
8110, Drums and Cans
8115, Boxes, Cartons and Crates
8120, Commercial and Industrial Gas Cylinders
8125, Bottles and Jars
8130, Reels and Spools
8135, Packaging and Packing Bulk Materials
8305, Textile Fabrics
8310, Yarn and Thread
8315, Notions and Apparel Findings
8320, Padding and Stuffing Materials
8325, Fur Materials
8330, Leather
8335, Shoe Findings and Soling Materials
8345, Flags and Pennants
8405, Outerwear, Mens'
8410, Outerwear, Womens'
8420, Underwear and Nightwear, Mens'
8425, Underwear and Nightwear, Womens'
8430, Footwear, Mens'
8435, Footwear, Womens'
8440, Hosiery, Handwear, and Clothing Accessories, Mens'
8445, Hosiery, Handwear, and Clothing Accessories, Womens'
8450, Childrens' and Infants' Apparel and Accessories
8460, Luggage
8510, Perfumes, Toilet Preparations and Powders
8520, Toilet Soap, Shaving Preparations and Dentifrices
8530, Personal Toiletry Articles
8540, Toiletry Paper Products
8710, Forage and Feed
8720, Fertilizers
8730, Seeds and Nursery Stock
8810, Live Animals, Raised for Food
8820, Live Animals, Not Raised for Food
8905, Meat, Poultry and Fish
8910, Dairy Foods and Eggs
8915, Fruits and Vegetables
8920, Bakery and Cereal Products
8925, Sugar Confectionery and Nuts
8930, Jams, Jellies, and Preserves
8935, Soups and Bouillons
8940, Special Dietary Foods and Food Specialty Preparations
8945, Food Oils and Fats
8950, Condiments and Related Products
8955, Coffee, Tea and Cocoa
8960, Beverages, Nonalcoholic

8965, Beverages, Alcoholic
8970, Composite Food Packages
8975, Tobacco Products
9110, Fuels, Solid
9130, Liquid Propellants and Fuels, Petroleum Base
9135, Liquid Propellants, Fuels and Oxidizers, Chemical Base
9140, Fuel Oils
9150, Oils and Greases, Cutting, Lube and Hydraulic
9160, Miscellaneous Waxes, Oils and Fats
9310, Paper and Paperboard
9320, Rubber Fabricated Materials
9330, Plastics Fabricated Materials
9340, Glass Fabricated Materials
9350, Refractories and Fire Surfacing Materials
9390, Miscellaneous Fabricated Nonmetallic Materials
9410, Crude Grades of Plant Materials
9420, Fibers, Vegetable, Animal and Synthetic
9430, Miscellaneous Crude Animal Products, Inedible
9440, Miscellaneous Crude Agricultural and Forestry Products
9450, Nonmetallic Scrap, Except Textile
9505, Wire, Nonelectrical, Iron and Steel
9510, Bars and Rods, Iron and Steel
9515, Plate, Sheet, and Strip, Iron and Steel
9520, Structural Shapes, Iron and Steel
9525, Wire, Nonelectrical, Nonferrous Base Metal
9530, Bars and Rods, Nonferrous Base Metal
9535, Plate, Sheet, Strip and Foil, Nonferrous Base Metal
9540, Structural Shapes, Nonferrous Base Metal
9545, Plate, Sheet, Strip, Foil and Wire, Precious Metal
9610, Ores
9620, Minerals, Natural and Synthetic
9630, Additive Metal Materials and Master Alloys
9640, Iron and Steel, Primary and Semi-Finished Products
9650, Nonferrous Base Metal, Refinery and Intermediate Forms
9670, Iron and Steel Scrap
9680, Nonferrous Metal Scrap
9905, Signs, Advertising Displays and Identification Plates
9910, Jewelry
9915, Collectors' Items
9920, Smokers' Articles and Matches
9925, Ecclesiastical Equipment, Furnishings and Supplies
9930, Memorials, Cemeterial and Mortuary Equipment and Supplies
9999, Miscellaneous Items
